

Sample questions (FORCES)

1. A 1000-kg elevator is rising and its speed is increasing at 3m/s^2 . The tension force of the cable on the elevator is:

- A. 6800N
- B. 1000N
- C. 3000N
- D. 9800N
- E. 12800N**

ans: E

2. A 25-N crate slides down a frictionless incline that is 25° above the horizontal. The magnitude of the normal force of the incline on the crate is:

- A. 11 N
- B. 25 N**
- C. 40 N
- D. 100 N
- E. 220 N

ans: B

3. A 5-kg concrete block is lowered with a downward acceleration of 2.8m/s^2 by means of a rope. The tension in the rope is:

- A. 14 N, up
- B. 14 N, down
- C. 35 N, up
- D. 35 N, down**
- E. 49 N, up

ans: D

4. A car is traveling at 15m/s on a horizontal road. The brakes are applied and the car skids to a stop in 4.0 s . The coefficient of kinetic friction between the tires and road is:

- A. 0.38
- B. 0.69
- C. 0.76
- D. 0.92
- E. 1.11

ans: A

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5. An automobile moves on a level horizontal road in a circle of radius 9 m. The maximum speed with which the car can round the curve is 3.0 m/s. Calculate the coefficient of friction between tires and road. (Use $g=10 \text{ m/s}^2$)

- A. 0.1
 - B. 1.0
 - C. 0.5
 - D. 0.3
 - E. 0.7
- ans: A

6. One end of a 1.0-m long string is fixed, the other end is attached to a 2.0-kg stone. The stone swings in a vertical circle, passing the bottom point at 4.0m/s. The tension force of the string at this point is about:

- A. 0
 - B. 12N
 - C. 20N
 - D. 32N
 - E. 52N
- ans: E

7. One end of a 1.0-m string is fixed, the other end is attached to a 2.0-kg stone. The stone swings in a vertical circle, passing the top point at 4.0m/s. The tension force of the string (in newtons) at this point is about:

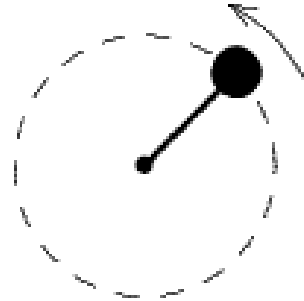
- A. 0
 - B. 12
 - C. 20
 - D. 32
 - E. 52
- ans: B

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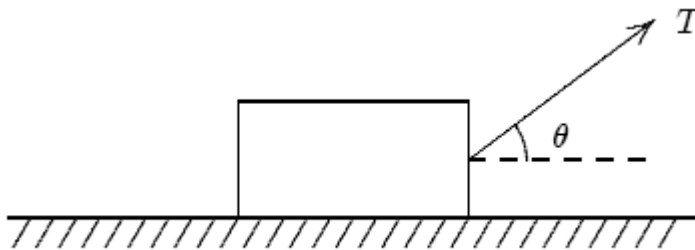
8. The iron ball shown is being swung in a vertical circle at the end of a 40-m long string. How slowly can the ball go through its top position without having the string go slack? (Use $g=10 \text{ m/s}^2$)

- A. 400m/s
- B. 20 m/s
- C. 4.9m/s
- D. 40m/s
- E. 9.8m/s

ans: B



9. A block of mass m is pulled along a rough horizontal floor by an applied force T as shown. The vertical component on the block by the floor is



- A) mg
- B) $mg - T \cos\theta$
- C) $mg + T \cos\theta$
- D) $mg - T \sin\theta$
- E) $mg + T \sin\theta$

Ans D

10. A block is placed on a rough wooden plane. It is found that when the plane is tilted 30 degree to the horizontal, the block will slide down at constant speed.

The coefficient of kinetic friction of the block with plane is:

- A) 0.500
- B) 0.577
- C) 1.73
- D) 0.866
- E) 4.90

Ans.B

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11. A horizontal force of 1000 N is needed to overcome the force of static friction between a level floor and a 250-kg crate. If $g = 10 \text{ m/s}^2$, what is the coefficient of static friction?

- a. **0.40**
- b. 0.55
- c. 0.20
- d. 2.5
- e. 0.25

ANS. A

12. Two blocks, joined by a string, have masses of 4.0 and 6.0 kg. They rest on a frictionless horizontal surface. A 2nd string, attached only to the 6-kg block, has horizontal force 10 N applied to it. Both blocks accelerate. Find the tension in the string between the blocks.

- a. 10 N
- b. 2.5 N
- c. 40 N
- d. 1.7 N
- e. **4 N**

ANS: E

13. A small coin is placed on a flat horizontal turntable. The turn table is observed to make one revolution in 3.14 s.

(a) What is the speed of the coin when it rides without slipping at a distance 0.2 m from the center of the turntable? [ANS: 0.4 m/s]

(b) What is the coefficient of static friction between the coin and the turntable, if the coin is observed to slide off the turntable when it is more than 0.2 m from the center of the turntable? Use $g = 10 \text{ m/s}^2$. [ANS: $\mu_s = 0.08$]

16. A 1000-kg car travels across the crest of a circular hump of radius 30.0 m. What is the maximum speed at which the car can go over the hump without losing contact with the road? The coefficients of friction between the road and the car's tires are $\mu_s = 0.3$ and $\mu_k = 0.2$. Use $g = 10 \text{ m/s}^2$.

- (A) **17.3 m/s**
- (B) 25.1 m/s
- (C) 20.0 m/s
- (D) 15.0 m/s

ANS: A

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14. A minimum force of 30N pushing a 1.0 kg block against a vertical wall, is required to prevent a block from sliding down a vertical wall. Calculate the coefficient of static friction between the wall and the block. Use $g = 10 \text{ m/s}^2$.

- (A) 0.33
- (B) 0.16
- (C) 0.66
- (D) 3.00
- (E) none of the above

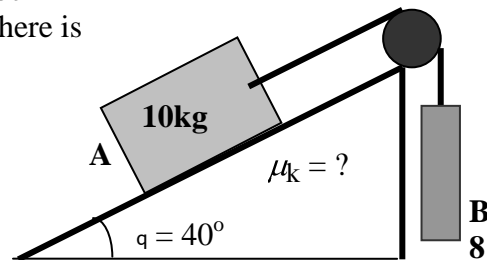
ANS: A

15. A ball of mass $m = 0.5 \text{ kg}$ falls in a liquid. The ball reaches a terminal velocity of 0.5 m/s . Calculate the value of the drag coefficient b . Use $g=10\text{m/s}^2$,

- a. 10 kg/s
- b. 10 kg/m
- c. 5 kg/s
- d. 5 kg/m
- e. none of the above

ANS: A

16. Two blocks are connected over a pulley as shown in the figure. The mass of the block A is 10 kg and the mass of the hanging block B is 8 kg. The block A *slides up the 40° -incline at a constant speed*. There is a friction force between the incline and the block A.



(a) Find the tension in the string .

Ans. ____ 80 N

(b) Find the x -component of the weight of block A, where x is taken parallel to the incline.

Ans. ____ 64.3 N

(c) Find the normal force that the incline exerts on block A.

Ans. ____ 76.6 N

(d) Determine the coefficient of kinetic friction between the block A and the incline.

Ans. ____ 0.2

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17. Two blocks with the masses of **7.1 kg** (weight 70N) and **3.6 kg** (weight 35N) are connected by a massless string passing over a massless pulley attached to the edge of frictionless table. (See figure below.). Hence the masses will accelerate. What is the magnitude of tension in the string?

- A) 23 N
- B) 35 N
- C) 52.5 N
- D) 70 N
- E) 0 N

ANS: A

